19. (a) Discuss the Mulliken symbol for irreducible representations. (6)

(b) List the symmetry elements and assign the point group of NH_3 and CO_2. (4)

20. Write notes on orthogonality theorem and its consequences.

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APRIL/MAY 2024

DCH23/GCH23 — PHYSICAL CHEMISTRY — II

Time : Three hours Maximum : 75 marks

Shanmuga Industries Arts & Science College T.V.Malai

SECTION A — (10 × 2 = 20 marks)

Answer ALL questions.

1. Write the principle of stopped flow method.

2. What is meant by first and second explosion limits?

3. Define: mean ionic activity coefficient.

4. According to Debye Huckel limiting law the activity coefficient is always less than one. Justify.

5. Explain IHP and OHP at the electrode — electrolyte interface.

6. Define membrane potential.

7. Assign the point group to the following molecules.
   (a) Methyl chloride
   (b) Hydrogen

8. Define order of a group.

9. State the point group for BF_3.

10. Mention the application of group theory.

SECTION B — (5 × 5 = 25 marks)

Answer ALL questions.

11. (a) Discuss the general mechanism of chain reactions.

Or

(b) Describe the stopped flow method for studying kinetics of fast reactions.

12. (a) What are the limitations of Debye-Huckel limiting law?

Or

(b) How will you determine activity coefficient by electrochemical method?

13. (a) Write a note on electro-capillary phenomena.

Or

(b) Explain Stem model of electrical double layer.

14. (a) Define symmetry operations and symmetry elements.

Or

(b) Write a note on reducible and irreducible representations.

15. (a) Construct the character table for the C_{2v} point group.

Or

(b) Point out the symmetry selection rule in the case of IR Spectroscopy.

SECTION C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. Discuss Rice-Herzfeld mechanism for decomposition of acetaldehyde.

17. Derive Debye — Huckel limiting law. How it is modified at higher concentration?

18. Describe thermodynamic treatment of electrified interfaces leading to the derivation of Lippmann equation.